IN THE CLAIMS

Please amend the claims as follows:

Claim 1 (Currently Amended): A diagnostic system for plasma processing, said diagnostic system comprising:

a multi-modal resonator;

a power source, including a Gunn diode voltage controlled oscillator (VCO), coupled to said multi-modal resonator;

a detector coupled to said multi-modal resonator;

a controller coupled to said power source and said detector, wherein said controller provides at least one monitoring function and at least one controlling function, said at least one monitoring function including at least one of a Gunn diode voltage monitor, a Gunn diode current monitor, a varactor voltage monitor, an electron density monitor, and a detector voltage monitor, and said at least one controlling function including at least one of a varactor voltage control, a varactor voltage sweep control, a resonance lock-on control, and a graphical user control; and

a programmable user interface connected to said controller, said programmable user interface selecting ~~to select~~ said at least one monitoring function and said at least one controlling function in the diagnostic system~~, said user interface being connected to said controller~~.

Claim 2 (Previously Presented): The diagnostic system as recited in claim 1, wherein said user interface includes a man-machine interface (MMI) for performing said at least one function.

Claim 3 (Original): The diagnostic system as recited in claim 1, wherein said controller is further coupled to a remote controller, and said controller permits remote control of said controller using said remote controller.

Claim 4 (Original): The diagnostic system as recited in claim 3, wherein said remote controller provides a remote man-machine interface (MMI) for remotely performing said at least one function provided by said controller.

Claim 5 (Original): The diagnostic system as recited in claim 4, wherein said remote man-machine interface comprises a graphical user interface (GUI).

Claim 6 (Original): The diagnostic system as recited in claim 4, wherein said man-machine interface comprises executing software on said remote controller.

Claim 7 (Original): The diagnostic system as recited in claim 2, wherein said MMI displays at least one of a Gunn diode voltage, a Gunn diode current, a varactor voltage, and a detector voltage.

Claim 8 (Original): The diagnostic system as recited in claim 2, wherein said varactor voltage control function provides the capability for varying the varactor voltage on said Gunn diode VCO using said MMI.

Claim 9 (Original): The diagnostic system as recited in claim 2, wherein said varactor voltage sweep function provides the capability for automatically varying the varactor voltage on said Gunn diode VCO using said MMI.

Claim 10 (Original): The diagnostic system as recited in claim 9, wherein said automatically varying the varactor voltage on said Gunn diode VCO comprises activating a sweep generator packaged in said controller using said MMI.

Claim 11 (Original): The diagnostic system as recited in claim 2, wherein said resonance lock-on function comprises activating a lock-on circuit packaged in said controller, setting a varactor voltage set-point, and activating said varactor voltage set-point.

Claim 12 (Original): The diagnostic system as recited in claim 5, wherein said graphical user interface provides a setup panel for presenting a plurality of setup parameters.

Claim 13 (Original): The diagnostic system as recited in claim 12, wherein said plurality of setup parameters comprises at least one of a minimum varactor diode sweep voltage, a maximum varactor diode sweep voltage, a dither amplitude, and a varactor voltage set point.

Claim 14 (Original): The diagnostic system as recited in claim 5, wherein said graphical user interface provides a data directory panel, said data directory panel permits setting a directory location for storing data acquired using said remote man-machine interface.

Claim 15 (Original): The diagnostic system as recited in claim 5, wherein said graphical user interface provides a graph panel, said graph panel permits at least one of

setting a data scale factor, setting a data file name, performing a print action, performing a copy action, and performing a scale action.

Claim 16 (Original): The diagnostic system as recited in claim 5, wherein said graphical user interface provides a display panel for presenting at least one data parameter.

Claim 17 (Original): The diagnostic system as recited in claim 16, wherein said data parameter includes a Gunn diode voltage, a Gunn diode current, a varactor diode voltage, and a detector voltage.

Claim 18 (Original): The diagnostic system as recited in claim 16, wherein said graphical user interface further provides a plot panel for selecting said at least one data parameter.

Claim 19 (Original): The diagnostic system as recited in claim 5, wherein said graphical user interface provides a mode panel for selecting at least one of a control function mode and a data acquisition mode.

Claim 20 (Original): The diagnostic system as recited in claim 19, wherein said control function modes comprises at least one of a varactor voltage sweep function and a resonance lock-on function.

Claim 21 (Original): The diagnostic system as recited in claim 19, wherein said data acquisition mode comprises at least one of enabling data storage to a data file and disabling data storage to a data file.

Claim 22 (Original): The diagnostic system as recited in claim 19, wherein said graphical user interface provides an action mode, said action mode permits an operator to execute said control function mode.

Claim 23 (Original): The diagnostic system as recited in claim 19, wherein said graphical user interface provides a lock-on panel for setting at least one data acquisition parameter.

Claim 24 (Original): The diagnostic system as recited in claim 23, wherein said data acquisition parameters include a sample rate, a sample duration, and a sample mode.

Claim 25 (Original): The diagnostic system as recited in claim 1, wherein said controller further provides a graphical user interface (GUI) for performing said at least one function.

Claim 26 (Previously Presented): A method of controlling a diagnostic system, said diagnostic system comprising a multi-modal resonator to produce a cavity resonance, a power source to produce an output frequency, a detector to produce a transmission signal, a controller coupled to said power source and said detector, and a user interface connected to said controller and programmable to select at least one monitoring function and at least one controlling function, said method comprising:

activating said controller;

selecting from said user interface a varactor voltage control in order to control a varactor voltage of said power source;

selecting from said user interface a detector voltage monitor in order to monitor said transmission signal from said detector; and

adjusting said varactor voltage for said power source using said controller.

Claim 27 (Previously Presented): The method as recited in claim 26, wherein said user interface comprises a man-machine interface for performing at least one of setting said control function, setting said monitor function, and adjusting said varactor voltage.

Claim 28 (Original): The method as recited in claim 26, wherein said controller provides a graphical user interface for performing at least one of setting said control function, setting said monitor function, and adjusting said varactor voltage.

Claim 29 (Previously Presented): A method of controlling a diagnostic system, said diagnostic system comprising a multi-modal resonator to produce a cavity resonance, a power source to produce an output frequency, a detector to produce a transmission signal, a controller coupled to said power source and said detector, and a user interface connected to said controller and programmable to select at least one monitoring function and at least one controlling function, said method comprising:

activating said controller;

selecting from said user interface a varactor voltage sweep control in order to automatically control a varactor voltage of said power source;

coupling said varactor voltage to a display; and

coupling said transmission signal from said detector to said display.

Claim 30 (Original): The method as recited in claim 29, wherein said display comprises at least one of a computer, a digital signal processor, and an oscilloscope.

Claim 31 (Previously Presented): The method as recited in claim 29, wherein said user interface comprises a man-machine interface for performing said setting said control function.

Claim 32 (Original): The method as recited in claim 29, wherein said controller provides a graphical user interface for performing said setting said control function.

Claim 33 (Previously Presented): A method of controlling a diagnostic system, said diagnostic system comprising a multi-modal resonator to produce a cavity resonance, a power source to produce an output frequency, a detector to produce a transmission signal, a controller coupled to said power source and said detector and configured to provide a lock-on circuit for receiving said transmission signal from said detector and locking said output frequency of said power source to said cavity resonance of said multi-modal resonator, and a user interface connected to said controller and programmable to select at least one monitoring function and at least one controlling function, said method comprising:

activating said controller;

selecting from said user interface a resonance lock-on function;

selecting from said user interface a varactor voltage of said power source; and

locking said output frequency of said power source to said cavity resonance of said multi-modal resonator by activating a varactor voltage set-point using said controller.

Claim 34 (Original): The method as recited in claim 33, wherein said method further comprises the step of:

measuring an electron density in said multi-modal resonator, wherein said measuring said electron density comprises the steps of:

recording said varactor voltage corresponding to said locking said output frequency of said power source to said cavity resonance of said multi-modal resonator;

determining a difference between said varactor voltage with plasma in said multi-modal resonator and said varactor voltage without plasma in said multi-modal resonator; and

computing said electron density from said difference.

Claim 35 (Previously Presented): The method as recited in claim 33, wherein said user interface comprises a man-machine interface for setting said control function, setting said varactor voltage set-point, and activating said varactor voltage set-point.

Claim 36 (Original): The method as recited in claim 33, wherein said controller provides a graphical user interface for setting said control function, setting said varactor voltage set-point, and activating said varactor voltage set-point.

Claim 37 (Previously Presented): A method of controlling a diagnostic system, said diagnostic system comprising a multi-modal resonator to produce a cavity resonance, a power source to produce an output frequency, a detector to produce a transmission signal, a controller coupled to said power source and said detector, a remote controller coupled to said controller, and a user interface connected to said remote controller and programmable to select at least one monitoring function and at least one controlling function, said method comprising:

activating said controller;

activating said user interface;

selecting from said user interface a varactor voltage sweep control; and

activating said varactor voltage sweep control using default settings.

Claim 38 (Original): The method as recited in claim 37, wherein said method further comprises modifying said default settings prior to activating said varactor voltage sweep function.

Claim 39 (Original): The method as recited in claim 38, wherein said modifying said default settings comprises modifying at least one of a minimum varactor diode voltage, a maximum varactor diode voltage, a data directory for storing acquired data, a scale, a plot variable, and a data acquisition mode.

Claim 40 (Previously Presented): A method of controlling a diagnostic system, said diagnostic system comprising a multi-modal resonator to produce a cavity resonance, a power source to produce an output frequency, a detector to produce a transmission signal, a controller coupled to said power source and said detector and configured to provide a lock-on circuit for receiving said transmission signal from said detector and locking said output frequency of said power source to said cavity resonance of said multi-modal resonator, a remote controller coupled to said controller, and a user interface connected to said remote controller and programmable to select at least one monitoring function and at least one controlling function, said method comprising:

activating said controller;

activating said rface;

selecting from said user interface a resonance lock-on control; and

activating said resonance lock-on control using default settings.

Claim 41 (Original): The method as recited in claim 40, wherein said method further comprises modifying said default settings prior to activating said resonance lock-on control.

Claim 42 (Original): The method as recited in claim 41, wherein said modifying said default settings comprises modifying at least one of a dither amplitude, a varactor voltage set-point, a data directory for storing acquired data, a scale, a plot variable, a sample rate, a sample duration, and a data acquisition mode.